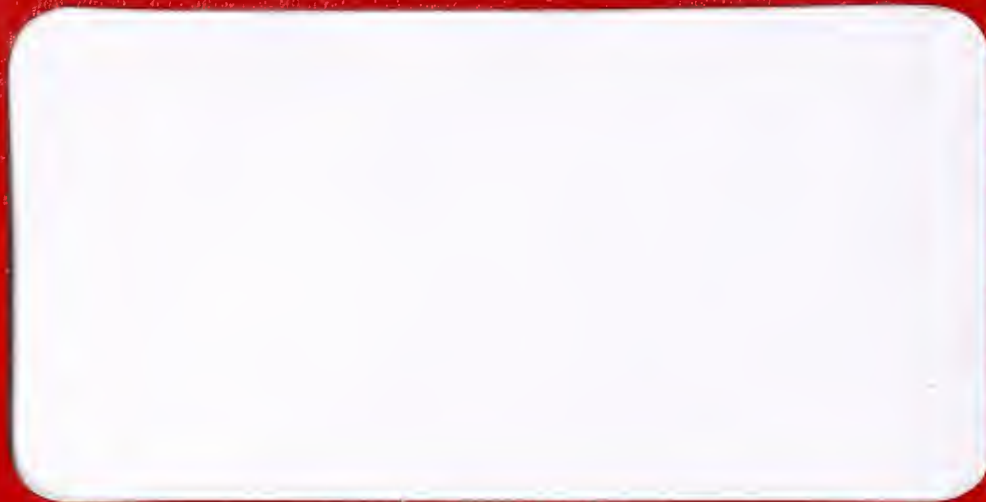


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PRESENTATION
TO
THE DUN AND BRADSTREET CORPORATION



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AUTHOR

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TITLE

Innovation in the Reprographics
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PRESENTATION
TO
THE DUN AND BRADSTREET CORPORATION

INNOVATION IN
THE REPROGRAPHICS INDUSTRY

May 1980

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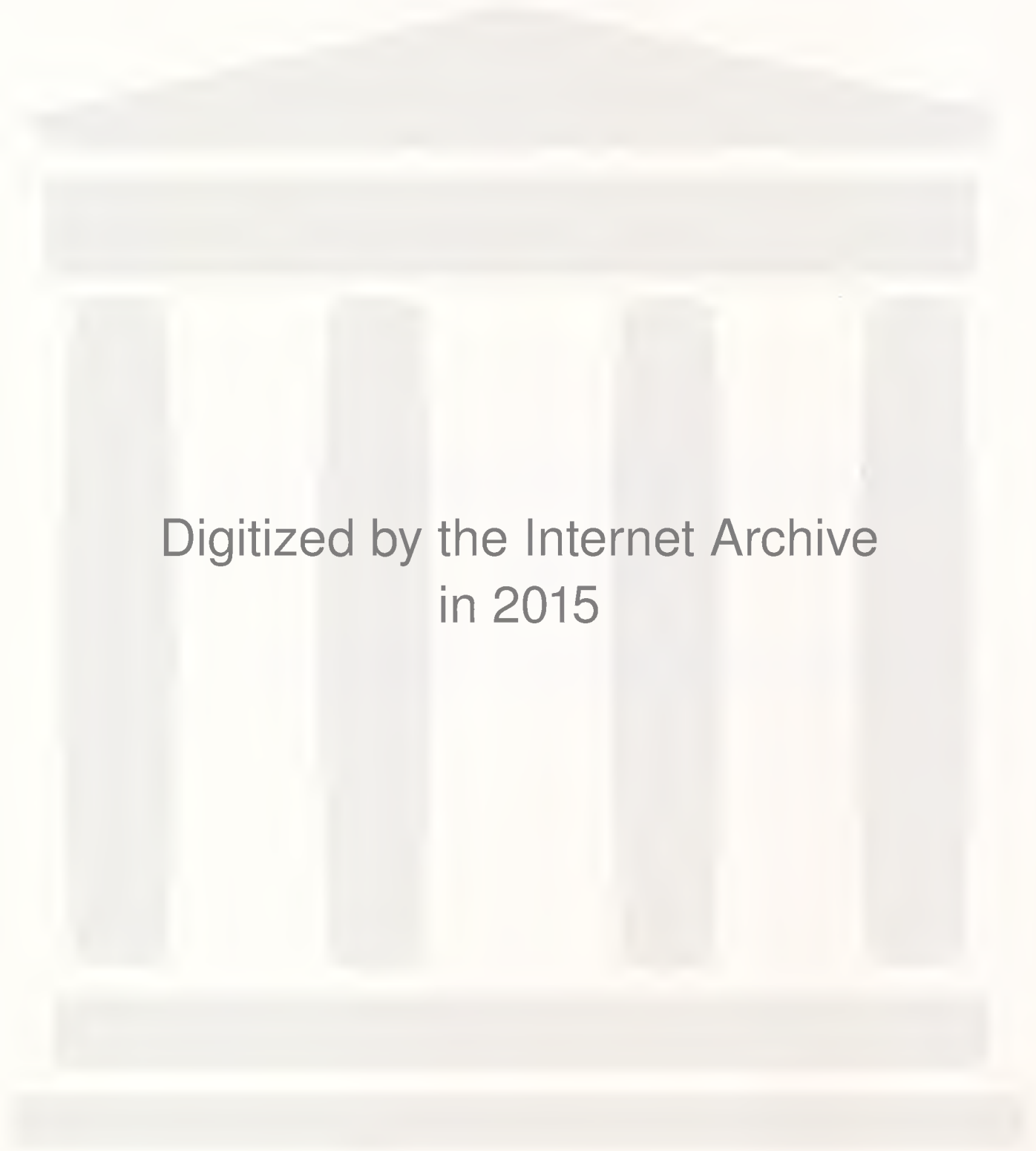
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INNOVATION IN THE REPROGRAPHICS INDUSTRY

MAY 1980

THE DUN AND BRADSTREET CORPORATION

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REPROGRAPHICS

- THOSE METHODS OF FACILITATING THE REPRODUCTION OF IMAGES ON PAPER
- HAS ITS ROOTS IN
 - WRITING
 - DRAWING
 - PRINTING
 - DUPLICATION
 - TYPEWRITING
 - OFFICE COPYING
- RAPID ESCALATION AFTER A MILLENIA OF SLOW EVOLUTION

REPROGRAPHICS

BEGINNINGS-BACK TO THE DAWN OF HISTORY

- SYMBOLS
 - CAVE DRAWINGS-LINES REPRESENTING NATURE
 - CUNEIFORM-REPETITION OF SINGLE ELEMENTS TO FORM CHARACTERS
 - HIEROGLYPHICS-TRANSFORMING SPEECH INTO WRITING
 - ALPHABETS-STANDARDIZED SYSTEM WITH INFINITE FLEXIBILITY
- RELATED ACTIVITIES
 - PAPYRUS-EASY PAPER SOURCE FROM THE BANKS OF THE NILE
 - SCRIBES AND COPYISTS-LABOR INTENSIVE METHOD FOR REPRODUCTION IN A LABOR INTENSIVE SLAVE SOCIETY
 - PHOENICIANS-SPREAD THE ALPHABET TO THE MEDITERRANEAN
 - TSAI LUN IN CHINA INVENTS THE BASIC PAPER MAKING PROCESS FROM CELLULOSE PULP (AD 105)
 - ROMAN CAPITALS ESTABLISH ALPHABET STANDARDS (ARCH OF TROJAN)

REPROGRAPHICS

THE LAST MILLENIUM (UP TO 1900)

- BEFORE 1500 A.D.
 - BOOK OF KELLS (7TH CENTURY A.D.) ESTABLISHES THE PINNACLE OF CRAFTSMANSHIP FOR HANDMADE BOOKS WHICH ARE WORKS OF ART
 - 1454 JOHANN GUTENBERG OPENS UP A NEW WORLD OF INFORMATION DISSEMINATION WITH HIS INVENTION OF MOVABLE TYPE-AN ORDER OF MAGNITUDE PRODUCTIVITY IMPROVEMENT IN BOOK MANUFACTURE
 - 1478 CAXTON IN ENGLAND PERFECTS THE METHODOLOGY OF USING GUTENBURG'S INVENTION. ALL OF WESTERN EUROPE ADOPTS HIS SYSTEM IMMEDIATELY
- AFTER 1500 A.D.
 - 18TH CENTURY-CASLON AND BODONI DESIGN "READABLE" TYPEFACES
 - 1798 SENEFELDER INVENTS OIL/STONE LITHOGRAPHY AS AN ART CURIOSITY
 - 19TH CENTURY-THE FOURDRINIER PAPERMAKING MACHINE FOR THE MASS PRODUCTION OF CHEAP ALPHACELLULOSE PAPER
 - 1874 REMINGTON PERFECTS THE LOW-COST MANUAL TYPEWRITER WHICH IS CAPABLE OF MASS PRODUCTION

REPROGRAPHICS

THE LAST MILLENIUM (UP TO 1900) cont.

- 1875 IVES PERFECTS THE HALFTONE SCREEN FOR THE REPRODUCTION OF PHOTOGRAPHS
- 1885 OTTMAR MERGENTHALER INVENTS THE LINO-TYPE LINECASTING MACHINE WHICH IMPROVES THE PRODUCTIVITY OF TYPESETTING BY A FACTOR OF FIVE

INPUT

REPROGRAPHICS

EARLY 20TH CENTURY

- TECHNIQUES

- 1905 IRA REVEL DEVELOPS COMMERCIAL OFFSET PRINTING FROM LITHOGRAPHY
- 1915 ROTOGRAVURE IS DEVELOPED FOR VERY HIGH VOLUME PRINTING USING LABORIOUS GELATIN RESIST TECHNIQUE
- COLOR SEPARATION NEGATIVE HALFTONE TECHNIQUES DEVELOP BUT ARE EXPENSIVE AND TIME CONSUMING
- CARBON PAPER AND TISSUE SETS IN A TYPEWRITER ARE THE ONLY MEANS OF DUPLICATING CORRESPONDENCE
- DIAZONIUM SALTS ARE USED TO TREAT PAPER WHICH CAN SHOW AN IMAGE AFTER AMMONIA EXPOSURE (BLUEPRINT PAPER-INTRODUCED BY OZALID OF ENGLAND)
- SPIRIT AND STENCIL DUPLICATORS ARE INTRODUCED WHICH ARE RELATIVELY CHEAP BUT PRODUCE LOW-QUALITY BLUE IMAGES (MIMEOGRAPH AND SPEED-O-PRINT)

- DEVICES

- 1910 PHOTO OFFSET IS INVENTED

REPROGRAPHICS

EARLY 20TH CENTURY cont.

- BERTHOLD, ALPHATYPE AND VARITYPER AMONG OTHERS INTRODUCE PHOTOTYPESETTING DEVICES OF ELEMENTARY CAPABILITY
- ADDRESSOGRAPH-MULTIGRAPH AND A. B. DICK INTRODUCE RELATIVELY INEXPENSIVE OFFSET DUPLICATORS FOR OFFICE USE

REPROGRAPHICS

OFFICE COPYING COMES OF AGE

- DR. CARLSON PERFECTS XEROGRAPHY ON A KITCHEN TABLE IN ASTORIA, NEW YORK, IN 1938. HE FINALLY (1959) GETS THE HALOID CORPORATION OF ROCHESTER, NEW YORK TO MARKET HIS INVENTION
- DR. EDITH WEYDE OF GEVAERT INVENTS (1946) THE SILVER DIFFUSION TRANSFER PROCESS AND SOON A LARGE NUMBER OF COMPETITORS OFFER COPIER SYSTEMS BASED ON THE NEW TECHNOLOGY. THE IMAGES ARE BLACK ON WHITE AS WELL AS PERMANENT BUT STILL REQUIRE SINGLE-SHEET FEEDING AND SMELLY LIQUID CHEMICALS
- EASTMAN KODAK'S RECORDAK MICROFILMER IS INTRODUCED IN 1948. IT CAN ARCHIVE FROM ORIGINAL DOCUMENTS BUT THE RETRIEVAL AND BLOW UP PROCESS (PHOTOGRAPHICALLY) IS DIFFICULT AND EXPENSIVE. MICROFILM PERSISTS UP TO THE PRESENT (AND FOR AT LEAST ANOTHER GENERATION) BUT IS LIMITED TO SPECIFIC APPLICATIONS WITHIN PAPER INTENSIVE INDUSTRIES - BANKING, INSURANCE AND GOVERNMENT
- 3M'S THERMOFAX INTRODUCES (1952) THE PROCESS OF COPYING DIRECTLY FROM AN ORIGINAL

REPROGRAPHICS

OFFICE COPYING COMES OF AGE cont.

- EK INTRODUCES (1953) A SILVER BASED COPIER PROCESS CALLED VERIFAX WHICH IS MUCH MORE STABLE THAN 3M'S THERMAL PROCESS BUT STILL REQUIRES A SHEET-BY-SINGLE SHEET OPERATION
- ELECTROSTATIC COPYING (1955) USING ZINC OXIDE COATED PAPER OPENS UP THE WORLD OF MULTIPLE OFFICE COPIES AT THE PUSH OF A BUTTON. THE COPIES HAVE A "GREASY" FEEL AND LIQUID TONERS ARE REQUIRED BUT THE COPIES ARE GOOD. THE U.S. MARKET QUICKLY ACCEPTS 3M, NASHUA, A.B. DICK AND A HOST OF JAPANESE SUPPLIERS

REPROGRAPHICS

XEROGRAPHY-1960 TO PRESENT

- THE XEROX 813 AND XEROX 914 CONVINCED THE U.S. OFFICE THAT A PLAIN PAPER, DRY COPIER OF EXCELLENT QUALITY IS THE ONLY WAY TO REPRODUCE ORIGINAL DOCUMENTS. THIS OCCURS WITHIN A FIVE YEAR TIME SPAN DESPITE:
 - AT LEAST A 50% (USUALLY 100%) SURCHARGE OVER OTHER TECHNOLOGIES
 - THE DEMISE OF ALL OTHER COPIER SYSTEMS. ZINC OXIDE COATED PAPER PERSISTS FOR 10 YEARS BUT AT AN EVER INCREASING DECELERATION AND ONLY IN SMALL OFFICES
- XEROX SUCCEEDS IN ADDING THE COPIER TO THE TYPEWRITER AND THE TELEPHONE AS "STANDARD EQUIPMENT" IN ALL OFFICES
- THE BELLS AND WHISTLES ADDED BY XEROX ALL ARE AIMED AT INCREASING PRODUCTIVITY
 - A COLLATOR BECOMES STANDARD EQUIPMENT
 - THE REDUCTION CAPABILITY OF THE 7000 LARGE DOCUMENT COPIER IS AIMED AT TRANSFORMING COMPUTER PRINTOUTS INTO 8½" x 11" FOR EASY FILING

REPROGRAPHICS

XEROGRAPHY-1960 TO PRESENT cont.

- THE 6500 COLOR COPIER REMAINS A MARKET ABERRATION BUT AN INTRIGUING CURIOSITY. ONLY SALES ARE TO QUICK COPY CENTERS FOR PRINTING FROM 35MM TRANSPARENCIES

INPUT

REPROGRAPHICS

PRODUCTIVITY BECOMES THE KEYNOTE FOR XEROX

- THE 9200 WITH AN \$100,000 PRICE TAG INTRODUCES THE CONCEPTS OF:
 - AUTOMATED DOCUMENT FEED (A CIRCULATOR TO PERMIT THE OUTPUT OF FINISHED DOCUMENT SETS AS OPPOSED TO DUPLICATING INDIVIDUAL PAGES AND THEN COLLATING)
 - REQUIRING A DEDICATED OPERATOR AT A CENTRALIZED REPRODUCTION DEPARTMENT (INFERRING THE USER COMPANY CAN CHANNEL THE BULK OF ITS COPYING TO A SINGLE LOCATION)
 - XEROGRAPHIC COPYING DIRECTLY CHALLENGING THE NATURAL MARKET FOR AUTOMATED OFFSET DUPLICATING WHICH IS ABOVE 50 TO 100 COPIES PER ORIGINAL
- THE 9400 IS A PRODUCT UPGRADE WITH DUPLEXING (TWO-SIDED) CAPABILITY. THIS IS A FURTHER ATTEMPT TO SUPPLANT OFFSET DUPLICATION
- THE 1200 IS A COPIER BASED UNIT DESIGNED FOR HIGH-VOLUME OUTPUT OF 8½" X 11" DIRECTLY FROM COMPUTER TAPE
 - CHARACTERS ARE CREATED FROM SIGNAL ON THE FLY BY PULSING A STROBOSCOPIC LIGHT THROUGH A SPINNING MATRIX DISC
 - IT IS A BREAKTHROUGH FOR XEROX THAT PAPER IS OUTPUTTED DIRECTLY FROM ELECTRONIC IMPULSES

REPROGRAPHIC

JAPANESE FILL THE LOW END GAP

- AS THE ORIGINAL XEROX PATENTS BEGIN TO EXPIRE, A HOST OF JAPANESE COMPANIES LEAP INTO THE LOW END "GAP"
 - THE NAME OF THIS GAME IS TO OFFER PLAIN PAPER COPYING FOR ONLY marginally higher prices than the now obsolete electrostatic coated paper copying devices
- FIRST \$10,000, THEN \$5,000 AND FINALLY THE \$2,000 PRICE LEVEL IS BROACHED
 - DEALERS LINE UP TO OFFER THESE UNITS ON A DIRECT SALE BASIS
- SAVIN REPRESENTING RICOH BECOMES THE UNDISPUTED LEADER IN THIS SEGMENT
 - SAXON, CARON, SHARP, MINOLTA, MITA AND TOSHIBA COME ALONG STRONGLY
- SUCCESS AT THE LOW END PROMPTS THE JAPANESE TO TRY TO EXPAND DIRECTLY AGAINST XEROX
 - BUT THEY HAVE TROUBLE BRIDGING THE SPEED GAP AT ABOUT 40 COPIES PER MINUTE

REPROGRAPHICS

COMPETITION ARISES IN THE U.S.

- IBM OFFERS ITS COPIER I AND COPIER II WITH MODEST SPEED AND FINDS THAT THE MARKET RESPONSE IS OVERWHELMING. THE DURABILITY, RELIABILITY AND THE IBM "IMAGE" SECURE IT A SIGNIFICANT PERCENTAGE OF THE MARKET BUT XEROX IS SO FAR AHEAD IT PRETENDS NOT TO NOTICE
- EASTMAN KODAK INTRODUCES THE EKTAPRINT 100 AT 120 CPM AND MAJOR XEROX USERS SIT UP AND TAKE NOTICE. FORTUNATELY FOR XEROX THE EK THRUST IS CONTROLLED ON A STEP-BY-STEP BASIS AND PENETRATION IS NOT DRAMATIC
- IBM FALLS ON ITS FACE WITH THE COPIER III BECAUSE OF ALL THINGS, UNRELIABLE MANUFACTURING STANDARDS, XEROX GAINS A LITTLE MORE BREATHING ROOM
- IBM COMES BACK STRONGLY WITH THE 6640 AND 6670. ONE A INK JET AND THE OTHER A PLAIN PAPER COPIER. THEY ARE DESIGNED TO OUTPUT HIGH QUALITY ON PAPER DIRECTLY FROM ELECTRONIC SIGNAL (EITHER FROM DATA PROCESSING OR WORD PROCESSING). IBM THUS CLOSES THE GAP BETWEEN THE IMPACT PRINTER AND THE ISOLATED COPIER GIVING BIRTH TO THE "INTELLIGENT COPIER"

REPROGRAPHICS

COMPETITION ARISES IN THE U.S. cont.

- XEROX TRIES A NEW TARGET WITH THE 9700. MAKING A 9200 INTO A COMPUTER OUTPUT PRINTER BUT BOTH IBM AND SIEMENS INTRODUCE COMPETITIVE PRODUCTS, ALL OF WHICH RUN \$300,000 WITH MARKETS LIMITED TO LARGE DATA PROCESSING DEPARTMENTS

INPUT

REPROGRAPHICS

CURRENT MARKETPLACE-LINES OF DEMARCATION ARE NOW MUDDIED

- THE 6670 IS THE HOTTEST REPROGRAPHICS PRODUCT SINCE THE ORIGINAL XEROX INVENTION
- THE XEROX OFFERING BASED ON A 5400 CHASSIS IS EXPECTED MOMENTARILY BUT XEROX WILL NEED AN "INTELLIGENT COPIER" IN EVERY SPEED CLASSIFICATION
- THE JAPANESE THREAT IS AGAIN EVIDENT AS TOSHIBA, RICOH AND KONISHIROKU OFFER VERSIONS OF THE "INTELLIGENT COPIER"
- THE RICOH PRODUCT WILL BE WATCHED CLOSELY SINCE RICOH HAS SEVERED THE SAVIN RELATIONSHIP AND EACH COMPANY MUST NOW ACT INDEPENDENTLY. SAVIN HAS THE TOUGHER JOB, THAT OF LEARNING HOW TO MAKE A RELIABLE COPIER DEVICE AT LOW COST FROM SCRATCH
- "INTELLIGENT COPIERS" WILL REPLACE TRADITIONAL IMPACT PRINTING IN OFFICE TYPING AS WELL AS IN DATA PROCESSING OUTPUT. THEY WILL PERFORM THE OUTPUT FUNCTION FOR ELECTRONIC MAIL, REMOTE DATA BASE RETRIVAL SYSTEMS AND FOR DISTRIBUTED DATA PROCESSING

REPROGRAPHICS

CURRENT MARKETPLACE-LINE OF DEMARCATION
ARE NOW MUDDIED

- THESE "INTELLIGENT COPIERS" WILL USE BOTH LASER BEAM AND CRT/FIBER OPTIC BUNDLES AS CHARACTER GENERATING MODES. THE LATTER FOR LOW PRICED LOCAL PRINTERS AND THE FORMER FOR THE HIGH-QUALITY, HIGH-SPEED PRINTERS IN CENTRALIZED LOCATIONS

— INPUT —

REPROGRAPHICS

SUMMARY OF EVENTS

- LITTLE CHANGE BETWEEN 1500 AND 1900 DUE TO LACK OF TECHNOLOGY
- CHEMICAL AND MECHANICAL TECHNOLOGY CAUSE MANY CHANGES AFTER 1900
 - NEW VENDORS ENTER MARKET
- A MAJOR INVENTION, XEROGRAPHY, ALLOWS ONE COMPANY, XEROX, TO DOMINATE OFFICE REPROGRAPHICS STARTING IN 1960'S
- XEROX MOVES TO HIGH END OF COPIER SYSTEMS AND LEAVES LOW END OPEN
 - JAPANESE ENTER
- MAJOR COMPETITORS SUCH AS IBM AND EASTMAN KODAK CHALLENGE ON HIGH END
- ELECTRONICS BECOMES A FACTOR WITH FIBER OPTICS, AND LASER BEAM SYSTEMS
 - NEW ENTRANTS

INPUT

REPROGRAPHICS

ANALYSIS OF EVENTS

- TECHNOLOGY ALLOWS CREATION OF A NEW COMPANY, XEROX, TO DOMINATE OFFICE REPROGRAPHICS FOR 15 YEARS
- STRONG COMPETITORS SUCH AS IBM AND EASTMAN KODAK MEET XEROX HEAD ON
- WEAKER COMPETITORS, JAPANESE, FIND A NITCH
- ELECTRONICS MAY CHANGE THE MARKETPLACE

INPUT

REPROGRAPHICS

OUTLOOK

- SALES VALUE OF COPIER EQUIPMENT IN THE U.S. TODAY APPROXIMATES \$3 BILLION
- GROWTH OVER A FIVE YEAR PERIOD WILL BE IN EXCESS OF 15% PER YEAR ON A CONSTANT DOLLAR BASIS
- THIS GROWTH WILL BE PRIMARILY IN THE PLACEMENT OF "INTELLIGENT COPIERS" HAVING THE CAPABILITY OF GENERATING HARD COPY OUTPUT DIRECTLY FROM ELECTRONIC SIGNAL
- NON-INTELLIGENT XEROGRAPHIC COPIERS WILL HAVE LESS STARTLING GROWTH BECAUSE OF AT LEAST PARTIAL SATURATION BUT TWO PRODUCT SEGMENTS WILL REMAIN STRONG:
 - VERY HIGH SPEED UNITS DESIGNED FOR MAXIMUM PRODUCTIVITY
 - VERY LOW-COST UNITS DESIGNED FOR LOCAL OR REMOTE USAGE
- A SUCCESSION OF SPECIALIZED "INTELLIGENT COPIERS" CAN BE EXPECTED IN EVERY PRICE RANGE TO PERFORM EVERY OUTPUT PRINTING FUNCTION. THIS WILL BE THE PREVALENT MODE OF PAPER GENERATION, FACSIMILE AND COLOR WILL BE ADDED FOR EVEN MORE SPECIALIZED APPLICATIONS

